AMENDMENTS TO THE SPECIFICATION

Please replace paragraph 30, page 6, with the following rewritten paragraph:

-- Figures 3 a-d ~~depicts~~ depict an orbital cycle of the apparatus shown in Figure 1. --

Please replace paragraph 47, page 10, with the following rewritten paragraph:

-- *Flaws, waviness, roughness* and *lay*, taken collectively, are the properties which constitute *surface texture*. Flaws are unintentional, unexpected and unwanted interruptions of *topography* of the work piece surface. Flaws are typically isolated features, such as burrs, gouges and scratches, sprue flashings in casting, rolled edges, and similar features. --

Please replace paragraph 49, page 10, with the following rewritten paragraph:

-- *Waviness* refers to the topographical irregularities in the *surface* texture of longer wave lengths, or lower frequency than *roughness* of the surface of a work piece. *Waviness* is commonly an attribute associated with the limits of control and stability of a particular methodology by which the work piece is made. Waviness may arise, for example, from machine or work piece vibration or deflection during fabrication, tool chatter and the like. --

Please replace paragraph 52, page 11, with the following rewritten paragraph:

-- In the present invention, a method of abrasive working of a work piece with a visco-elastic medium filled with a solid particulate abrasive is provided, at its broadest comprising the steps of:

mounting a work piece on a repetitive motion drive mechanism adapted to impart relative motion between the work piece and the visco-elastic medium, where the relative motion may be reciprocating linear motion, orbital motion, gyratory motion, rotary motion, or the resultant of a combination or two or more such motions. The relative motion may be varied in amplitude and/or in frequency over time;

the work piece is placed in conformal contact with a flowable visco-elastic abrasive medium. It is preferred that the visco-~~plastic~~elastic abrasive medium has a static viscosity of from about $\eta = 2 \times 10^4$ Centipoise to about $\eta = 8 \times 10^6$ Centipoise. It is also preferred that the visco-elastic abrasive medium is a rheopectic polymer filled with a particulate solid abrasive, and particularly preferred that the rheopectic polymer is a poly(boro-siloxane). --

Please replace paragraph 59, page 13, with the following rewritten paragraph:

-- The translational velocity of the relative motion between the visco-elastic medium and areas of the work piece at least substantially parallel to the direction of the relative motion is greater than the relaxation rate of the visco-elastic medium, such that the visco-elastic medium and the areas of the work piece at least substantially parallel to the direction of the relative motion are in abrasive working contact throughout each ~~the~~ cycle. --

Please replace paragraph 71, page 14, with the following rewritten paragraph:

-- The present invention is capable of use on work pieces of any material which can be worked by abrasives to effect light grinding, deburring, radiussing, leveling and polishing of work piece surfaces. Most commonly the invention will be employed with metal work pieces, including, for example, steels, including mild steel, tool steels, stainless steels, and the like, aluminum, aluminum-magnesium alloys, beryllium copper alloys, titanium, and many others. Less commonly, the invention may also be employed on ceramics, cerements, and other machinable composites, glass, semi-conductor materials, and the like. The operations of the present invention can also be employed to polish (and shape) hard plastic materials, such as polymers, including poly(methyl ~~methaerylate~~methacrylate) and poly(carbonates) and reinforced polymer composites, such as fiberglass laminates and the like. An interesting application arises in the polishing (and shaping) of poly(carbonate) lenses or glass lenses for optical systems, and the like.--

Please replace paragraph 78, page 16, with the following rewritten paragraph:

-- The leveling, flattening and fairing of surfaces is observed both in macro (grinding) reduction of errors of form and in micro (polishing) reduction of surface roughness and waviness aspects of the process. Surface protrusions, such as waviness, bumps and hollows in the work piece, in a few hundred micrometers (or ~~tens.~~ tens of mils) are reduced in relation to the surrounding surface areas while, concurrently, surface roughness is reduced as

well, as measured in a few, or even less than one, micrometers. Thus, both grinding and polishing are attained in the same operation. --

Please replace paragraph 88, page 18, with the following rewritten paragraph:

-- Either the abrasive medium, the work piece or both are subjected to a repetitive motion mechanism to produce a relative motion between the work piece and the medium. The relative motion may be reciprocating linear motion, orbital motion, gyratory motion, rotary motion, or the resultant of a combination ~~or~~ <u>of</u> two or more such motions. The relative motion may be varied in amplitude and/or in frequency over time.--

Please replace paragraph 102, page 21, with the following rewritten paragraph:

-- Either the abrasive medium, the work piece or both are operated upon by a repetitive motion mechanism to produce a relative motion between the work piece and the medium. The relative motion may be reciprocating linear motion, orbital motion, gyratory motion, rotary motion, or the resultant of a combination ~~or~~ <u>of</u> two or more such motions. The relative motion may be varied in amplitude and/or in frequency over time. --

Please replace paragraph 129, page 26, with the following rewritten paragraph:

-- In some cases, the action of the elastic deformation is sufficiently directional that a reversal of the direction of the relative notion drive is needed to assure reasonably uniform working of the surfaces. Such occasions arise, for example, when an

orbital drive is employed on complex shapes which present leading surface and trailing surface aspects. The orbital motion results in contact between the work piece and medium which is substantially tangential, and the leading aspects of the work piece surface receive more work than trailing aspects in such a case. To offset this differential effect, it is typically sufficient to reverse the drive mechanism ~~to~~ so the work piece is worked in both directions. Such directional effects do not generally occur with simple shapes. –

Please replace paragraph 143, page 28, with the following rewritten paragraph:

--The particle size of the abrasive should be the smallest size consistent ~~with.~~ with the required rate of working, in light of the hardness and roughness of the surface to be worked and the surface finish to be attained. In general terms, the smaller the particle or "grit" size of the abrasive, the smoother the surface attained. The abrasive will most often have a particle size of from as low as about 1 micrometer up to about 1400-1,600 micrometers (about 16 mesh) or even 2,000 micrometers. More commonly, the abrasive grain size will be in the range of from about 2 to about 400 micrometers, and most commonly from about 20 to about 300 micrometers. --

Please replace paragraph 146, page 29, with the following rewritten paragraph:

-- In general, the abrasive will desirably be employed at concentrations in the formulation at levels of from about 30 to about 90 weight percent, preferably about 65 to about 85 weight percent. We ~~have,~~ have found that operation at the preferred range, and lower in some cases, is quite effective. --

Please replace paragraph 153, page 30, with the following rewritten paragraph:

-- For a given abrasive particle size, we have also observed that the surface finish of the work piece is rapidly brought to the same or better levels attainable with hand polishing or lapping techniques, but with far less labor and time. When coupled ~~With~~ with the ability to use smaller particle sizes, it is ordinarily possible to produce surface finishes which require no hand surface finishing procedures, reducing the number of operations and the amount of labor and equipment required in production. When used to break or radius sharp edges and remove burrs, the technique is ~~rapid~~ rapidly effective and readily controlled. --

Please replace paragraph 157, page 31, with the following rewritten paragraph:

-- In abrasive flow machining, including orbital abrasive flow machining it is a primary objective to obtain solid or quasi-solid plug flow of the media across the work piece surface, and flow, whether plastic or plug flow, is the dominant mode of action. No or substantially no elastic deformation of the media is wanted or produced. The strain rates applied to the media are limited to levels which produce the desired flow characteristics, in contrast to the present invention where the strain rates are sufficient to produce a substantial and predominant level of elastic deformation in the media, while flow is ~~25~~ purposely minimized (but not eliminated; some flow is required to assure circulation and turnover of the abrasive particles at the media-work piece surface interface). As a result of this different

mode of action, the polishing effects on the surface of the work piece are maximized in the present invention. --

Please replace paragraph 162, page 32, with the following rewritten paragraph:

-- The R_a apparatus illustrated in Figure 1 was employed to polish a plurality of coinage dies forged of tool steel and engraved with a design, and having a surface roughness as received of 25 micro-inches, R_a. The design was masked by filling with an epoxy resin, and the remaining surfaces of the dies were polished first for twelve minutes using a poly(boro-~~slioxane)~~siloxane) based media filled with 25 mm boron carbide abrasive, followed by a sixteen minute polishing operation with a second media formulation of the poly(boro-siloxane) filled with 2μm diamond abrasive. No displacer was employed. The apparatus employed an orbital motion having an eccentricity of 0.2 ~~inches~~ inch at an orbit ~~rate.~~ rate of 25 Hz. The unmasked areas of the dies were measured to have a surface roughness as finished of 0.2 micro-inches R_a. --

Please replace paragraph 163, page 32, with the following rewritten paragraph:

-- The apparatus illustrated in Figure 1 was also employed to polish a plurality of forged aluminum components of having a three-dimensionally complex shape. The components as received had a surface roughness of 100 to 120 micro-inches R_a. The apparatus was fitted with a displacer shaped as a complement of the shape of the components and providing a gap of 6 millimeters. The surface of the wheels were polished for 3.5

minutes, employing an orbit of 0.25 inch at a frequency of 17 Hz, employing poly(boro-siloxane) media and ~~a~~ an 80 mesh abrasive, followed by a second polishing of 2 minutes, employing an orbit of 0.25 inch at a frequency of 17 Hz, employing poly(boro-siloxane) media and a 220 mesh abrasive. The surfaces of the wheels were measured to have a surface roughness ranging from 20 to 25 micro-inches R_a as finished. --

Please replace paragraph 164, page 33, with the following rewritten paragraph:

-- The apparatus illustrated in Figure 1 was also employed to polish a plurality of cast aluminum automotive wheels having a complex shape. The wheels as received had a surface roughness of 140 to 175 micro-inches ~~R^a~~ R_a. The apparatus was fitted with a displacer shaped as a complement of the shape of the wheels and providing a gap of 6 millimeters. The surface of the wheels were polished for 3.5 minutes, employing an orbit of 0.25 inch at a frequency of 17 Hz, employing poly(boro-siloxane) media and an 80 mesh abrasive, followed by a second polishing for 1.5 minutes, employing an orbit of 0.25 inch at a frequency of 17 Hz, employing poly(boro-siloxane) media and a 220 mesh abrasive. The surfaces of the wheels were measured to have a surface roughness ranging from 20 to 25 micro-inches R_a as finished. --